I claim:

1. An apparatus for speeding up Retinex-type processing of an input image, comprising:

a sub-sampling algorithm, wherein one or more sub-sampled images of the input image are produced;

a non-linear illumination estimation module that receives the sub-sampled images and produces corresponding interim illumination estimations; and

one or more up-sampling algorithms, wherein the interim illumination estimations are interpolated to produce an illumination estimation, and wherein the illumination estimation is usable to perform a Retinex-type correction to the input image.

2. The apparatus of claim 1, wherein an up-sampling algorithm comprises an illumination interpolation algorithm, the illumination interpolation algorithm comprising an interpolation routine that receives the interim illumination estimations and a sampling rate, and produces the illumination estimation.

3. The apparatus of claim 2, wherein the illumination interpolation algorithm further comprises a local maximum routine, wherein the local maximum routine enforces an envelope constraint.

4. The apparatus of claim 1, wherein an up-sampling algorithm comprises:

a difference interpolation algorithm, the difference interpolation algorithm receiving the difference of the sub-sampled images and the interim illumination estimations, and a sampling rate and producing the interpolated difference; and

an adder that adds the interpolated difference and the input image.

5. The apparatus of claim 1, wherein the up-sampling algorithm comprises:

a difference interpolation algorithm that produces a difference-interpolated illumination estimation;

an illumination interpolation algorithm that produces an illumination-interpolated illumination estimation; and

an average module, wherein the illumination-interpolated and the difference interpolated illuminations are averaged to produce the illumination estimation.

6. The apparatus of claim 5, wherein the average module comprises a difference weight and an illumination weight, and wherein the difference weight is applied to the difference-interpolated illumination estimation and the illumination weight is applied to the illumination-interpolated illumination estimation.

7. The apparatus of claim 6, wherein the difference weight and the illumination weight change from location to location in the image such that for every location the difference weight and the illumination weight sum up to 1.

8. The apparatus of claim 6, wherein the difference weight and the illumination weight each equal 0.5.

9. The apparatus of claim 1, wherein the up-sampling algorithm comprises an interpolation cascade, comprising:

a difference interpolation algorithm; and

an illumination interpolation algorithm.

10. The apparatus of claim 9, wherein the illumination interpolation algorithm follows the difference interpolation algorithm.

11. The apparatus of claim 8, further comprising a difference interpolation rate R_D, an illumination interpolation rate R_I, and an overall interpolation rate R_O, and wherein the interpolation rates R_D, R_I, R_O change from location to location in the image.

12. The apparatus of claim 11, wherein for every location in the image the interpolation rates R_D, R_I and R_O obey $R_D * R_I = R_O$.

13. The apparatus of claim 1, further comprising an illumination manipulation module, wherein the input image and the illumination estimation are combined to produce an output image.

14. A method for speeding up Retinex processing of a high resolution input image, comprising:

sub-sampling the high resolution input image to produce one or more low resolution input images;

estimating an illumination of the low resolution images, wherein an interim illumination estimation is generated for each low resolution input image;

up-sampling the interim illumination estimation, wherein an illumination estimation suitable for Retinex-type correction is generated.

15. The method of claim 14, wherein up-sampling comprises:

receiving the interim illumination estimations and a sampling rate to produce the illumination estimation; and

applying a local maximum routine to enforce an envelope requirement.

16. The method of claim 14, wherein up-sampling, comprises:

subtracting the low resolution images and the interim illumination estimations to obtain difference images;

receiving the difference images and a sampling rate;

producing the illumination estimation; and

adding the illumination estimation and the input image.

17. The method of claim 14, wherein up-sampling comprises:

applying a difference interpolation algorithm to the interim illumination estimations to produce a difference interpolated illumination estimation;

applying an illumination interpolation algorithm to produce an illumination interpolated illumination estimation; and

averaging the illumination interpolated illumination estimation and the difference interpolated illumination estimation to produce the illumination estimation.

18. The method of claim 17, wherein averaging comprises:

applying a difference interpolation weighting factor to the difference interpolated illumination estimations; and

applying an illumination interpolation weighting factor to the illumination interpolated illumination estimation.

19. The method of claim 18, wherein the difference interpolation weighting factor and the illumination interpolation weighting factor sum to 1.

20. The method of claim 14, wherein the up-sampling comprises:

applying a difference interpolation algorithm; and

applying an illumination interpolation weighting factor, wherein the illumination estimation is generated.

21. The method of claim 14, further comprising combining the input image and the illumination to produce a Retinex-corrected output.

22. A method for speeding up Retinex processing of an image, comprising:

sub-sampling the image to produce low resolution images;

estimating an illumination of each of the low resolution images, wherein an interim illumination estimation is generated for each of the low resolution images;

applying a difference interpolation algorithm to the interim illumination estimations to produce a difference interpolated illumination estimation;

applying an illumination interpolation algorithm to produce an illumination interpolated illumination estimation; and

averaging the illumination interpolated illumination estimation and the difference interpolated illumination estimation to produce the illumination estimation.